

COMPUTER-MEDIATED CORRECTIVE FEEDBACK AND THE DEVELOPMENT OF L2 GRAMMAR

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This paper reports on a study that investigated the impact of two types of computer-mediated corrective feedback on the development of adult learners' L2 knowledge: (1) corrective feedback that reformulates the error in the form of recasts, and (2) corrective feedback that supplies the learner with metalinguistic information about the nature of the error. High intermediate and advanced adult learners of English ($n=23$) from an intact class at a Swedish university were randomly assigned to one of three conditions (two feedback conditions and one control) and were randomly paired with English native speakers. During task-based interaction via text-chat, the learners received focused corrective feedback on omission of the zero article with abstract noncount nouns (e.g., employment, global warming, culture). Computer-delivered pretests, posttests and delayed posttests of knowledge (acceptability judgments) measured learning outcomes. Results showed no significant advantage for either feedback type on immediate or sustained gains in target form knowledge, although the metalinguistic group showed significant immediate gains relative to the control condition.

INTRODUCTION

A growing body of research has begun to illuminate an emerging relationship between types of corrective feedback and second language learning in face-to-face interaction (e.g., Ammar & Spada, 2006; Carroll, 2001; Ellis, Loewen & Erlam, 2006; Hino, 2006; Loewen & Nabei, 2007; Lyster, 2004; McDonough, 2005). With the tools of technology making their way into the L2 classroom, corrective feedback delivered via written synchronous computer-mediated communication (SCMC) holds particular promise for the learning of especially complex or low salient forms due to the visual saliency of certain forms during written interaction, the amount of processing and planning time afforded by synchronous chat, and the enduring as opposed to ephemeral nature of the turns. Despite the potential advantages of SCMC for facilitating the noticing and learning of these low salient and difficult forms, research on learning outcomes following computer-mediated corrective feedback is still limited (e.g., Loewen & Erlam, 2006; Sachs & Suh, 2007). Accordingly, this present study explores learning outcomes following two computer-mediated corrective feedback treatments (recasts and metalinguistic prompts).

CORRECTIVE FEEDBACK AND SLA

It has been argued that corrective feedback plays a beneficial role in facilitating the acquisition of certain L2 forms, which may be difficult to learn through input alone, including forms that are rare, low in perceptual salience, semantically redundant, do not typically lead to communication breakdown (Long & Robinson, 1998), or that lack a clear form-meaning relationship (DeKeyser, 2005).

Corrective feedback, however, can be used to draw learners' attention to mismatches between the learners' production and the target-like realization of these hard-to-learn forms. For instance, a teacher may correctly reformulate the difficult form in a recast of the learner's initial utterance, in a sense juxtaposing input and output. By drawing a learner's attention to mismatches between input and output or between learner output and the target-like norm, corrective feedback can facilitate the occurrence of noticing, which Schmidt (2001) claims is "the first step in language building" (p. 31). According to Schmidt's (1990) Noticing Hypothesis, for learning to occur, second language learners must attend to and notice details and differences between the target language and their interlanguage and its representation in their

production of output. Corrective feedback, by juxtaposing learning output with input, can assist the acquisition of certain hard-to-learn forms by increasing the likelihood that they will be noticed.

However, beyond facilitating the noticing of hard-to-learn forms, it has also been suggested that certain types of corrective feedback may also promote L2 processing. Panova and Lyster (2002) argue, for instance, that corrective feedback which contains positive evidence about the target language (e.g., recasts) may be useful in the internalization of new forms, while corrective feedback which does not contain a full reformulation but instead requires that learners attempt self-repair or output modification may require deeper processing and thereby enhance control of already internalized L2 forms.

Research on Corrective Feedback and SLA Processes and Outcome

Three strands of research have investigated the effects of corrective feedback on second language process and outcomes: (1) the noticing of target language forms, (2) learner responses such as pushed output, and (3) the learning of L2 forms, as evidenced by improvement in L2 form knowledge and production. In this first strand of research, laboratory (Mackey, Gass & McDonough, 2000; Philp, 2003) and classroom-based studies (Lyster & Ranta, 1997; Nabei & Swain, 2002) have documented learner responses to feedback or the ability to recall the corrective feedback as indicators of noticing. In the second strand of research, classroom studies have found that certain approaches to feedback are more likely to result in pushed output, seen for example, in learners' self or other repair (Lyster & Ranta, 1997; Panova & Lyster, 2002), output modification (Pica, Holliday, Lewis & Morgenthaler, 1989) or accuracy in repair (Nassaji, 2007). And the third strand of research, outcomes-based studies, has attempted to document the benefits of corrective feedback targeted at specific L2 forms when provided for a variety of learners and interactional contexts (e.g., Doughty & Varela, 1998, for middle school aged children in a science class; Han, 2002 for adult learners in small group interaction). Of this third strand of research, there is a growing subset of comparison studies that have begun to examine the relative effectiveness of different types of corrective feedback on the acquisition of L2 forms.

Comparison Studies of Corrective Feedback

As has been noted in recent meta-analyses on corrective feedback (Mackey & Goo, 2007; Russell & Spada, 2006), the number of comparison studies examining certain types of corrective feedback (e.g., metalinguistic, elicitation) is still too limited to argue for the efficacy of one type of corrective feedback over another. Results from a number of comparison studies, however, have found advantages for certain types of corrective feedback for certain forms and for certain learners. This includes feedback that enhances the salience of positive evidence, feedback that provides learners the opportunity to produce pushed output and feedback that directly or indirectly supplies learners with metalinguistic information concerning the correct formulation of the target form.

Among studies that suggest a benefit for feedback which contains positive evidence is Leeman's (2003) investigation of two components of recasts (negative evidence and the enhanced salience of positive evidence), which found an advantage for feedback that contained only positive evidence over feedback that contained only negative evidence.

Research that suggests a superior benefit for corrective feedback that generates modified or pushed output (Swain, 1985) or repair includes Lyster's (2004) study of French immersion classes. Written posttest results showed a significant advantage for students receiving prompts (written feedback which prompts learners to attempt self-repair) while students in the recast condition performed similarly to students in the no feedback condition. Similarly, McDonough's (2005) study of four feedback combinations included two groups that received types of feedback that allowed them to modify output and two groups that did not. The results indicated that the number of learners who progressed to a more advanced level of question formation was greater for the first two groups than for the latter.

However, support for the relative advantage of corrective feedback that elicits self-repair or pushed output is not clear cut (Mackey & Philp, 1998). Results of a recent comparison study that examined recasts and prompts suggested that proficiency might be a key factor underlying the relative effectiveness of feedback that elicits repair (Ammar & Spada, 2006). While low proficiency learners who received prompts significantly outperformed those who received recasts, no significant difference was found for either type of feedback among high proficiency learners. This suggests that corrective feedback that provides learners the opportunity to produce pushed output may be beneficial for only certain types of learners.

Two further comparison studies of feedback found evidence suggesting that feedback containing metalinguistic information on the targeted form helps learners generalize the form to new contexts. Carroll (2001) examined the formation of English nouns from verb stems produced by learners in 4 feedback conditions and a control group. Though all treatment groups significantly outperformed the comparison group on immediate and delayed posttests of L2 form knowledge on items for which they had received feedback, only participants in the two groups that supplied the learners with either direct or indirect metalinguistic information concerning the target form error significantly outperformed the control group in new contexts.

The second of these two studies also investigated whether corrective feedback facilitated the development of implicit and explicit knowledge. Ellis, Loewen and Erlam (2006) examined learners' use of the English past tense marker *-ed* following exposure to either explicit corrective feedback (metalinguistic information) or implicit corrective feedback (recasts). Findings indicated that learners who received corrective feedback containing metalinguistic information significantly outperformed learners in the recast and control groups on tests of both implicit (oral elicited information) and explicit (grammaticality judgments) L2 knowledge. Furthermore, similar to the results of Carroll's (2001) study, metalinguistic corrective feedback and not recasts also seemed to promote generalization of the *-ed* form to new contexts.

Though these studies suggest advantages for corrective feedback that enhances the salience of positive evidence, provides learners the opportunity to produce pushed output, or supplies metalinguistic information concerning the target-form, the findings of other comparison studies of feedback do not support these trends. For instance, though all three feedback groups (clarification requests, recasts and metalinguistic feedback) in Loewen and Nabei's (2007) study improved more than their non-feedback comparison groups, no feedback group significantly outperformed the others. In their discussion of this lack of comparative advantage, Loewen and Nabei suggest that the brevity of the treatment (30 minutes) may have limited the ability for their study to elicit sufficient differential effects. Furthermore, institutional constraints, which prevented the administration of a delayed posttest, also meant that there was no opportunity to observe comparative advantages that may have emerged over time.

While face-to-face comparison studies have found advantages for certain types of corrective feedback over others, the limited number of outcomes-based studies on corrective feedback in CMC has found no such advantage. Loewen and Erlam's (2006) study, which investigated the relative effectiveness of recasts and metalinguistic prompts administered during small group text-chat interaction, found no significant advantage for either feedback type over the control condition and no significant advantage for one corrective feedback type over the other. Analysis of their participants' pre-tests suggested that these findings may have been influenced by the learners' low proficiency with the target form (English past tense *-ed*), an indicator that they may not have been at a high enough level to internalize and demonstrate gains resulting from the feedback during the short duration of the study. Similarly, a second CMC comparison study of corrective feedback found no significant difference in gains following two different types of corrective feedback: enhanced and non-enhanced recasts (Sachs & Suh, 2007). In this study, Sachs and Suh incorporated underlining and bolding of key elements of the recast that were related to the targeted form (backshifting of verbs from simple past to present perfect in reported speech). Despite a

higher level of form awareness reported by participants in the enhanced condition, no significant difference in target form accuracy was found between the groups.

Table 1. Characteristics of Lyster & Ranta's (1997) Categories of Corrective Feedback*

Corrective Feedback Type	Definition	Example(s)**	Nature of Error Indicated	Targetlike Reformulation Provided	Elicited Output
Explicit Error Correction	Explicit provision of the targetlike reformulation	You should say visited.	Yes	Provided directly	None or repetition
Metalinguistic Feedback	Comments, information or questions (that may or may not contain metalanguage but do not include the reformulation) related to the ill-formedness of the utterance	There's a mistake.	No	No	Identification of error and/or reformulation
		It's past tense.	Yes	Provided indirectly through metalinguistic hint at correct reformulation	Reformulation
		Did you use the past tense?	Yes	Provided indirectly through metalinguistic question concerning rule governing reformulation	Metalinguistic response, yes/no response, or reformulation
Elicitations	A prompt for the learner to reformulate	Try that again.	No	No	Reformulation
		How do we say that in the past tense?	Yes	No	Reformulation
		Yesterday we ...	Sometimes	No	Reformulation
Repetitions	Repetition of all or part of the utterance containing the error, often accompanied by a change in intonation	Yesterday we visit my aunt.	Sometimes	No	None or repetition
Recasts	Implicit reformulation of all or part of the learner's utterance	Yesterday we visited my aunt.	Yes	Reformulation provided	Repetition
		I visited my aunt last week.	Yes	Reformulation provided	Repetition
Translations	Target language translation of unsolicited use of the L1.	***	Yes	Reformulation provided	Repetition
Clarification Requests	An utterance indicating a problem in comprehension, accuracy or both.	Pardon?	No	No	Repetition, reformulation, or meaning elaboration

* The feedback types, definitions, examples, and elicited output for recasts are based upon the typology and examples set out by Lyster and Ranta (1997) and expanded upon in Lyster (1998) and Panova and Lyster (2002). The remaining categories represent my attempt to further flesh out the characteristics of each feedback type with respect to whether each indicates the nature of the error, provides the learner with a target-like reformulation of the initial error, and the type of output likely to be elicited.

**The examples for each category of feedback are in response to the following non-target-like utterance: "Yesterday we visit my aunt."

***Translation is not applicable for this particular type of error.

Corrective Feedback and Depth of Processing

It has been argued that certain types of feedback may benefit grammar development due to the type of information the corrective feedback provides the learner and the depth of processing this information may promote (Panova & Lyster, 2002). According to the categories of feedback observed in classroom interaction and described by Lyster and Ranta (1997), corrective feedback types vary with respect to the kind of information they supply the learner regarding the target-form error as well as to the type of output elicited in response to the feedback. These differences are illustrated in [Table 1](#).

Panova and Lyster (2002) argue that the nature of the response elicited by different types of feedback may elicit different levels of processing. They contend that the type of processing entailed by the production of modified output (the type of output elicited by elicitation and some types of metalinguistic feedback) demands a deeper level of processing than that required by simple repetition (the type of output that may be elicited by recasts). That is to say, the provision of positive evidence potentially eliminates the need for learners to call upon their own mental resources to retrieve (not merely parrot) target language forms, such that new connections in memory are not being developed (de Bot, 1996). Thus, one would expect that learners who received corrective feedback that precluded the requirement to produce pushed output (e.g., recasts) would not demonstrate gains in target form knowledge comparable to those seen in learners who received feedback that required them to modify their own output.

It is also possible, however, that the nature of face-to-face interaction may also influence the potential usefulness or success of less explicit corrective feedback such as recasts. In face-to-face spoken interaction, the ambiguity of the corrective intent of recasts, limited within-task processing time, and limitations in working memory capacity may impede the learners' ability to use recasts in ways that enable them to make effective cognitive comparisons. It is these limitations of what are otherwise effective properties of recasts delivered during face-to-face interaction that put SCMC in the form of text chat at an advantage for encoding recasts in ways that facilitate cognitive comparison.

SCMC as a Context for Research on Corrective Feedback

The features of text-chat that may make SCMC (text-chat) an ideal context for investigating second language acquisition processes (i.e., noticing, noticing the gap, pushed output) and outcomes from corrective feedback include the visual saliency of forms that are typically low in perceptual salience in oral interaction, the greater processing and planning time than that afforded by face-to-face oral interaction and the enduring as opposed to ephemeral nature of written turns that are recorded in the chat window on the computer screen.

According to Gass (1997), "saliency can be said to help ensure that particular forms are noticed by the learner and hence lead to rule strengthening" (p. 19). Certain forms, however, because they are brief and unstressed in rapid spoken interaction, are low in perceptual salience and appear to be particularly difficult for learners to notice. However, written interaction, such as that afforded by text-chat, may increase the visual saliency of linguistic forms (Chapelle, 2001), including, for instance, English articles, third person singular *-s*, and the past tense *-ed* morpheme.¹ Thus, the visual saliency of linguistic forms

during text-chat may help learners to either confirm or disconfirm currently held hypotheses about the target language (TL).

In addition, the slower turn taking in a written conversation allows interlocutors both increased processing time (Payne & Whitney, 2002) and increased online planning time. The pace of a text-chat conversation is slower than that of a spoken conversation: humans cannot type as quickly as they can speak even in their L1. Furthermore, increased processing and planning time results from the delay between turns, as most text-chat applications do not allow users to read their interlocutor's responses until the full message has been typed and transmitted. This protracted wait for the completed message contrasts with the immediate unfolding of a spoken utterance in real-time.

The increased time of text-chat may also be particularly beneficial for promoting noticing and production of TL forms that typically require greater control. Williams (2005) points out that one factor affecting what elements of input learners notice is time pressure. Thus the reduced time pressure to process incoming messages during text-chat may allow learners the opportunity to notice a broader range of linguistic forms in the input than they might notice in real-time spoken input. Furthermore, the reduced speed of text-chat (compared to face-to-face oral conversation) also affords language learners increased planning time to compose their own messages. Thus, the increased online planning time afforded by text-chat may be particularly beneficial for promoting not only attention to target language forms in the input but also closer attention to and monitoring of target language output.

The third feature of text-chat that may be beneficial for learners is the enduring as opposed to ephemeral record of the interaction. As regards face-to-face spoken interaction, Williams (2005) argues that noticing the gap may be a challenging process for language learners because they must compare interlanguage forms with memory traces that may have already degraded. In contrast to the highly ephemeral nature of most face-to-face oral interaction one of the key features of interaction via text-chat is an enduring visual record of the exchange in the chat window. This chat window, Smith (2005) suggests, functions as an accessible record that may mirror the benefits of repetition and redundancy by allowing chatters to continually "refresh memory traces" (Payne & Whitney, 2002, p. 14).

Thus, L2 learners who struggle to notice the gap or recognize the nuances of corrective feedback may benefit from renewed opportunities to review and compare their initial utterance with their interlocutor's more target-like reformulation, particularly when the reformulation is complex or especially low in perceptual salience. The enduring accessibility of prior turns preserved in the chat window means learners can scroll-back through the interaction to review and reuse TL forms available in the input, the correct formulation of which they may be uncertain of or have already forgotten. Accordingly, the enduring nature of text-chat permits quick hypothesis confirmation and may promote the reuse of TL forms.

THE CURRENT STUDY

This study builds upon the body of face-to-face comparison studies of corrective feedback outlined above and incorporates written SCMC and its potential benefits for facilitating noticing of form. The purpose of the current study is to examine and compare the immediate and sustained effects of two different types of corrective feedback (metalinguistic feedback and recasts) delivered via written SCMC on the development of L2 grammar among intermediate and advanced learners of English who possess prior knowledge of the target form.

Research Questions

The following two research questions were posed:

Which type of corrective feedback delivered via written SCMC is more effective for *immediate* gains in L2 target form knowledge: corrective feedback which reformulates learners' errors or corrective feedback which informs learners of the nature of their errors?

Which type of corrective feedback delivered via written SCMC is more effective for gains in L2 knowledge *over time*: corrective feedback which reformulates learners' errors or corrective feedback which informs learners of the nature of their errors?

The effects of corrective feedback on learning were assessed in both familiar repeated contexts (i.e., noun phrases that occurred during the treatment and on prior tests) and unique unrepeated contexts (i.e., noun phrases that did not occur during the treatment or prior tests).

METHODOLOGY

Participants

The informants in this study ($n=23$) were volunteers from a first year undergraduate English grammar and translation course at Malmö University College in Malmö, Sweden. The participants' mean age was 24, and the average number of years of prior formal English instruction was 11. Most participants reported Swedish as their native language. The remaining five participants were L1 speakers of Arabic, Bosnian or Spanish. Regardless of L1, however, all participants were long-term residents of Sweden and all but one had received the majority of their formal English instruction in Sweden. The participants' communicative English proficiency could be characterized as intermediate to advanced as determined by their passing of [English A](#), the compulsory upper secondary level English course offered in Sweden, a requirement for enrollment in their program of study. In addition, participants who completed the grammar component of the English language version of DIALANG, a low-stakes, Web-based diagnostic test of language skills (Chapelle & Douglas, 2006), received scores ranging from B1 to C2 (low intermediate to high advanced). Participants were randomly assigned to one of three feedback conditions. A one-way ANOVA run on pre-test scores found no statistically significant difference among the three groups, $F(2,20) = .141, p = .87$, indicating that despite variation on grammar proficiency scores on the DIALANG, all three groups began with similar levels of knowledge of the target form. Details on each group's participants are indicated in [Appendix A](#).

In addition, 9 native English-speaking interlocutors were recruited from graduate programs at the University of Pennsylvania Graduate School of Education to interact with and provide corrective feedback to the Swedish participants via synchronous written CMC. These participants were familiarized with the target form and trained in the provision of the different types of corrective feedback as well as strategies to avoid supplying the learners with positive evidence of the target form.

Target Form

The target form used in this study was the English zero article with abstract noncount nouns (Holmes & Hinchliffe, 2003). This is a form which is low in perceptual salience (e.g., *Ø Unemployment is considered a serious problem; Can Ø culture be taught?*) and tends not to lead to communication breakdown when errors occur. As such, it represents a particularly challenging feature for Swedish learners of English to master. The difficulty of applying the zero article in these contexts may stem from the only partial correspondence between the English and Swedish article systems. Whereas use of the zero article does occur in shared contexts in both languages to express general meaning (e.g. *Ø Tid är Ø pengar* 'Ø Time is Ø money'), in other contexts Swedish uses instead the definite article (the end particles –et and –en) to express general meaning, as the following examples illustrate:

Svenskarna älskar naturen.

Swedes love nature.

Han fruktade döden och helvetet.

He feared death and hell.

(From Holmes & Hinchliffe, 2003, p. 49)

Thus, a typical error with the target form can be seen in the following example sentence produced by a Swedish learner of English, where the definite article has been substituted for the zero article before the noncount noun *unemployment*:

* A typical problem in Sweden is the unemployment.

(Köhlmyr, 2003, p. 254)

Materials

The materials used in this study included two computer-mediated collaborative writing activities completed by participants when paired with their native English-speaking interlocutors, as well as computer-delivered acceptability judgment pre-, post- and delayed posttests used to measure learning of target form knowledge.

Collaborative writing activities

In order to receive corrective feedback on the target form, participants engaged in open-ended computer-mediated collaborative writing activities (see [Appendixes B-E](#)) with their native English speaking chat partners. These collaborative writing activities consisted of a writing prompt on one of two themes (Swedish culture or global warming) and a bank of related words that needed to be incorporated into sentences that participants wrote each other. To ensure that the English language learners in each dyad received sufficient opportunity to produce the target form, they were supplied with word banks that contained only noun phrases, among which were 10 abstract noncount nouns.

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Preview Assessment October 13, 2006

Name: October 13, 2006

Instructions: This Test has a 15 minute timer. The elapsed time appears at the bottom of the window. A 1 minute warning will be displayed. [The timer does not appear when previewing this Test]

Timed Assessment: Not allowed. This Test can only be taken once.

Multiple Attempts: This Test must be completed now. It cannot be resumed later.

Force Completion: This Test does not allow backtracking. Changes to the answer after submission are prohibited.

Backtracking Prohibited: This Test does not allow backtracking. Changes to the answer after submission are prohibited.

Question Completion Status:

Question 4 0 points Save

Read the sentences below. Choose the sentence that sounds the MOST acceptable to you.

☐ Few would argue that the unemployment is not a serious concern for young people.

☐ Few would argue that an unemployment is not a serious concern for young people.

☐ Few would argue that unemployment is not a serious concern for young people.

Moving to the next question prevents changes to this answer. Question 4 of 35 |

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Figure 1. Screen capture of an acceptability judgment test item

Acceptability judgment tests

The computer-delivered acceptability judgment tests consisted of 35 questions each, of which 15 targeted the zero article. Of these 15 items, 10 contained noun phrases found in the word banks of the writing activities. The remaining 5 target items were unique or unrepeated items that did not appear on any other test or as part of the writing activities. The use of a combination of repeated and unrepeated items was intended to measure knowledge of the target form in both previously encountered and unique contexts. Acceptability judgment test scores were calculated using a percentage accuracy score for the 15 items targeting the zero article. Each correct judgment received one point; incorrect judgments received a zero. Internal consistency estimates of reliability were calculated for each acceptability judgment test; Cronbach's alpha was .86 for the pretest, .89 for the posttest, and .82 for the delayed posttest. The remaining 20 items targeted the definite or indefinite article or verb tense and mood.

Participants completed the acceptability judgment tests using *Blackboard's* test management system, which automatically randomized test items and displayed each item one at a time. Limitations on the interactivity and test item types *Blackboard* supported meant that the acceptability judgment items were designed using a multiple-choice format. Each test item consisted of three sentences that differed only with respect to the article placed before the abstract noncount nouns (definite, indefinite or zero article.) Participants were instructed to read all three sentences and then to select the sentence that seemed the most acceptable, as illustrated in [Figure 1](#).

Procedure

In order not to conflate the effects of instruction with the effects of feedback on development of target form knowledge, the study was conducted near the early part of the course term and concluded one week prior to the unit on English article systems, which included a lesson on the zero article². The study took place over four weeks with the pretest administered during the first week, the intervention and immediate posttest administered during the second week, and the delayed posttest administered two weeks later during the fourth week. The corrective feedback treatment sessions, utilizing the collaborative writing activities, were completed on two separate days during the second week. Up to 9 Swedish participants at a time were scheduled to chat with their respective American chat partners in individual chat rooms using the Virtual Classroom chat tool of *Blackboard*. For each activity, partners had 20 minutes to work together to complete the writing activity. During this collaborative period, the native English-speaking chat partners supplied corrective feedback when an error was made with the target form. [Table 2](#) illustrates how each type of corrective feedback was operationalized for each of the three groups.

Table 2. Responses to Errors*

CMCF Condition	Operationalization of Response to Target Form Error	Example	
Recast	Reformulation of the full sentence containing the error.	S:	In Sweden the global warming is a problem.
		A:	In Sweden global warming is a problem.
Metalinguistic prompt	A scripted meta statement reminding the student to use the zero article.	S:	In Sweden the global warming is a problem.
		A:	Be sure to use the zero article.
Control	Topic relevant response that does not contain the target form in the same context.	S:	In Sweden the global warming is a problem.
		A:	Many people believe it's a problem everywhere.

*S stands for Swedish chat partner while A stands for American chat partner.

In the recast condition, the full sentence containing the error was recast. Full as opposed to partial recasts were used due to the nature of the zero article, which lacks an orthographic representation. Thus, the inclusion of surrounding discourse was necessary to demonstrate that a reformulation of an error, and not merely a repetition of a particular noun, had occurred.

In the metalinguistic condition, the meta statement, “Be sure to use the zero article” was selected because it directly identified the nature of the error, incorporated meta-language (*the zero article*) that was to be covered later in the course, and avoided the inadvertent provision of positive evidence that other formulae might introduce (e.g., Don’t use *the* before *culture*). The frequency of errors and feedback generated during the treatment sessions is presented in Table 3.³

Table 3. Frequency of Errors and Feedback

	Total Errors	Mean Errors	Total Feedback	Mean Feedback
Recasts *	21	3.23	18	2.77
Metalinguistic **	33	4.4	27	3.6
Control	30	3.75	0	0

* The data for this group do not include the errors and feedback generated on day 2 of the treatment for one participant whose chatscript was corrupted and unrecoverable for post-treatment analysis.

** The data for this group do not include the errors and feedback generated on day 1 of the treatment for one participant, whose chatscript was corrupted and unrecoverable for post-treatment analysis.

Data Analysis

This study employed a mixed design with one between-subjects factor – feedback type (control, metalinguistic, recast) and one within-subjects factor – time (pretest, posttest, delayed posttest). To evaluate the effectiveness of the different feedback types, descriptive statistics for the pre-, post- and delayed posttests were computed. Then, a two-way repeated measures analysis of variance (ANOVA)⁴ was performed followed by post hoc pairwise contrasts for mean differences of the treatment conditions between tests.

RESULTS

All Items

Table 4 presents the descriptive statistics for all three tests. From pretest to immediate posttest, only the metalinguistic group demonstrated a mean gain (6.7%). In contrast, both the recast and control groups’ mean scores declined from pre to posttest, falling 3.8% and 11.6% respectively.

The delayed posttest mean score of the metalinguistic group, though still 5.9% higher than the pretest dipped slightly (.8%) from immediate posttest to delayed posttest. In contrast, the mean score of the recast group increased 8.5% from immediate to delayed posttest for a 4.7% increase from pre to delayed posttest. Though the control group’s mean score increased slightly from immediate to delayed posttest (.8%), the mean score on the delayed posttest was 10.8% lower than the pretest. Changes in group means over time are plotted on the graph in Figure 2.

Table 4. Mean and Standard Deviation for All Items

Condition	Statistic	Pretest (Week1)	Immediate Posttest (Week 2)	Delayed Posttest (Week 4)
Recast N=7	Mean Raw Score	10.857	10.286	11.571
	Mean %	.724	.686	.771
	SD	.202	.179	.256
Metalinguistic N=8	Mean Raw Score	11.375	12.375	12.250
	Mean %	.758	.825	.817
	SD	.107	.147	.154
Control N=8	Mean Raw Score	10.625	8.875	9.000
	Mean %	.708	.592	.600
	SD	.244	.253	.244

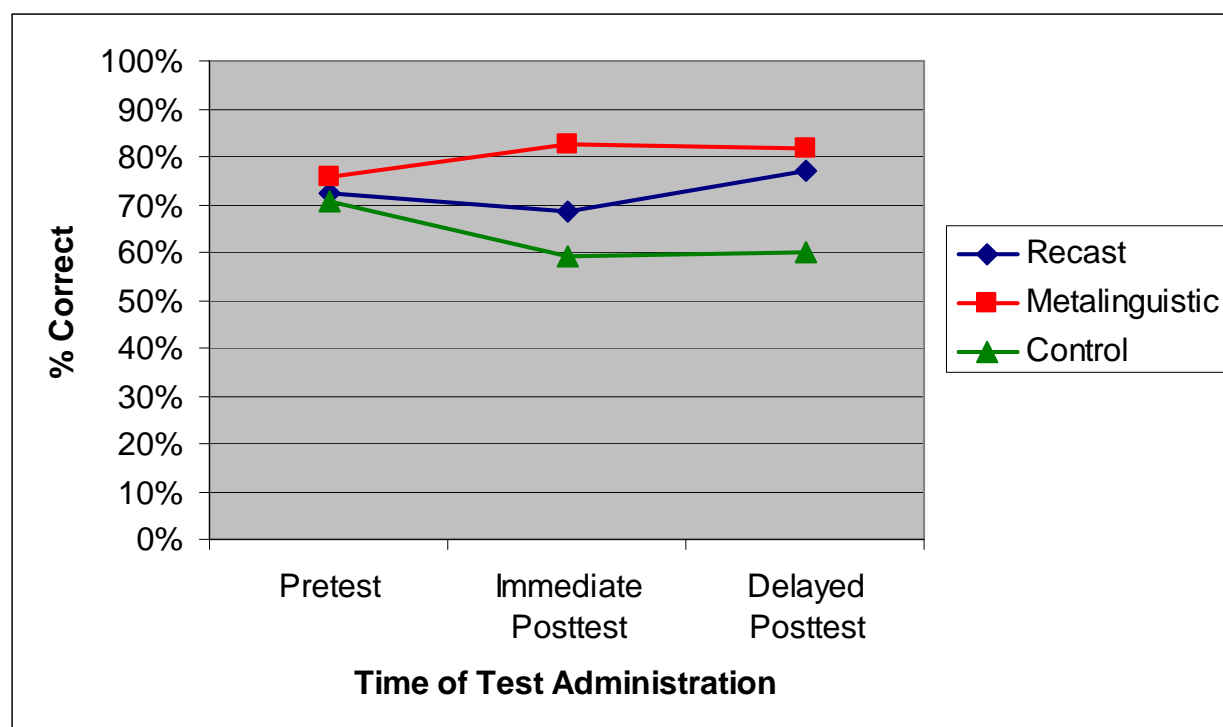


Figure 2. Group means for all items in pre-, post-, and delayed posttests

Results of the two-way repeated measures ANOVA found no significant main effect for group ($F(2,20) = 1.571, p = .23$, partial $\eta^2 = .14$) or time ($F(2,20) = .679, p = .51$, partial $\eta^2 = .03$) indicating that overall, the groups did not differ, nor was there significant change over time. Results did find a significant interaction between group and time ($F(2,20) = 2.750, p = .04$, partial $\eta^2 = .22$), indicating that changes in scores over time varied among the groups. Post hoc analysis showed that the metalinguistic group's score increased significantly more from pre to immediate posttest than did the control group's ($p = .03$). However, post hoc analysis did not find significant difference in score gains over time for the metalinguistic group over the recast group.

Thus, results showed that metalinguistic feedback was significantly more effective than no feedback for immediate gains in target form knowledge but that neither feedback type was significantly more effective than the other for either immediate or sustained gains in target form knowledge on all test items. As mentioned above, the acceptability judgment tests consisted of two types of items, repeated items and unrepeated items. Findings for these two groups are discussed below.

Repeated Items

Table 5 presents the descriptive statistics for repeated test items on all three tests. From pre-test to immediate posttest, both feedback groups improved, with the recast group improving 5.8% and the metalinguistic group improving 16.2%. The recast group continued to improve from immediate to delayed posttest resulting in an 11.5% higher score on the delayed posttest than on the pretest, narrowing in on the delayed posttest score of the metalinguistic group, which though 12.5% higher than the pretest, was 3.7% lower than the immediate posttest.

In contrast to the gain in mean scores for both feedback groups, the control group's mean score decreased 7.5% from pre- to immediate posttest, and increased only 5% from immediate to delayed posttest, which was 2.5% lower than the pretest mean score. Changes in group means over time for repeated items are plotted on the graph in Figure 3.

Results of the two-way repeated measures ANOVA found no significant main effect for group ($F(2,20) = 1.150, p = .34$, partial $\eta^2 = .1$) and a trend toward significance for time ($F(2,20) = 3.186, p = .05$, partial $\eta^2 = .137$). However, a significant interaction was found between group and time ($F(2,20) = 3.317, p = .02$, partial $\eta^2 = .249$), indicating that changes in scores over time varied among the groups. Post hoc analysis showed that the metalinguistic group's score increased significantly more from pre to immediate posttest than did the control group ($p = .02$). However, post hoc analysis did not find significant difference in score gains over time for the metalinguistic group over the recast group.

Thus, results showed that metalinguistic feedback was significantly more effective than no feedback for immediate gains in target form knowledge with familiar items but that neither feedback type was significantly more effective than the other for either immediate or sustained gains in target form knowledge with familiar items.

Table 5. Mean and Standard Deviation for Repeated Items

Condition	Statistic	Pretest (Week1)	Immediate Posttest (Week 2)	Delayed Posttest (Week 4)
Recast N=7	Mean Raw Score	6.714	7.286	7.857
	Mean	.671	.729	.786
	SD	.214	.206	.261
Metalinguistic N=8	Mean Raw Score	6.875	8.500	8.125
	Mean	.688	.850	.813
	SD	.113	.120	.164
Control N=8	Mean Raw Score	6.750	6.000	6.500
	Mean	.675	.600	.650
	SD	.238	.239	.239

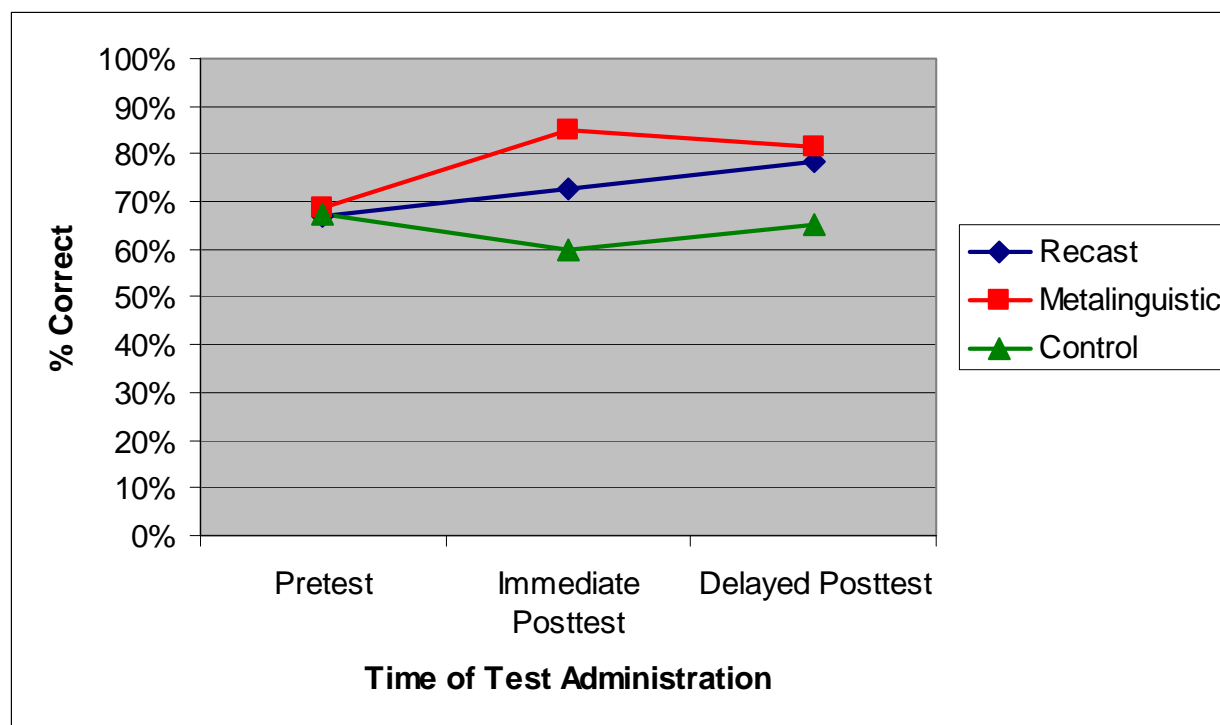


Figure 3. Group means for repeated items

Unrepeated Items

Table 6 presents the descriptive statistics for repeated test items on all three tests. Immediate posttest mean scores for unrepeated items for all three groups showed an immediate decrease from pretest scores, dropping 22.9%, 12.5% and 20% for the recast, metalinguistic and control groups respectively. From immediate to delayed posttest, both feedback groups' mean scores increased, 14.3% for the recast group and 5% for the metalinguistic group, though never achieving the initial pretest score mean. The control group's mean continued to decrease, dropping 7.5%. Changes in group means over time for repeated items are plotted on the graph in Figure 4.

Table 6. Mean and Standard Deviation for Unrepeated Items

Condition	Statistic	Pretest (Week1)	Immediate Posttest (Week 2)	Delayed Posttest (Week 4)
Recast N=7	Mean Raw Score	4.143	3.000	3.714
	Mean	.829	.600	.743
	SD	.243	.200	.378
Metalinguistic N=8	Mean Raw Score	4.500	3.875	4.125
	Mean	.900	.775	.825
	SD	.151	.225	.167
Control N=8	Mean Raw Score	3.875	2.875	2.500
	Mean	.775	.575	.500
	SD	.311	.311	.283

Results of the two-way repeated measures ANOVA found no significant main effect for group ($F(2,20) = 2.152, p = .14$, partial $\eta^2 = .18$) nor a significant interaction effect for group and time ($F(2,20) = .969, p = .44$, partial $\eta^2 = .09$). However, a significant main effect was found for time ($F(2,20) = 5.957, p = .005$, partial $\eta^2 = .23$). Thus, these results offer no indication that either type of feedback had an immediate or sustained positive effect on participants' knowledge of the target form with nouns that had not been encountered on prior tests or during the collaborative writing activity.

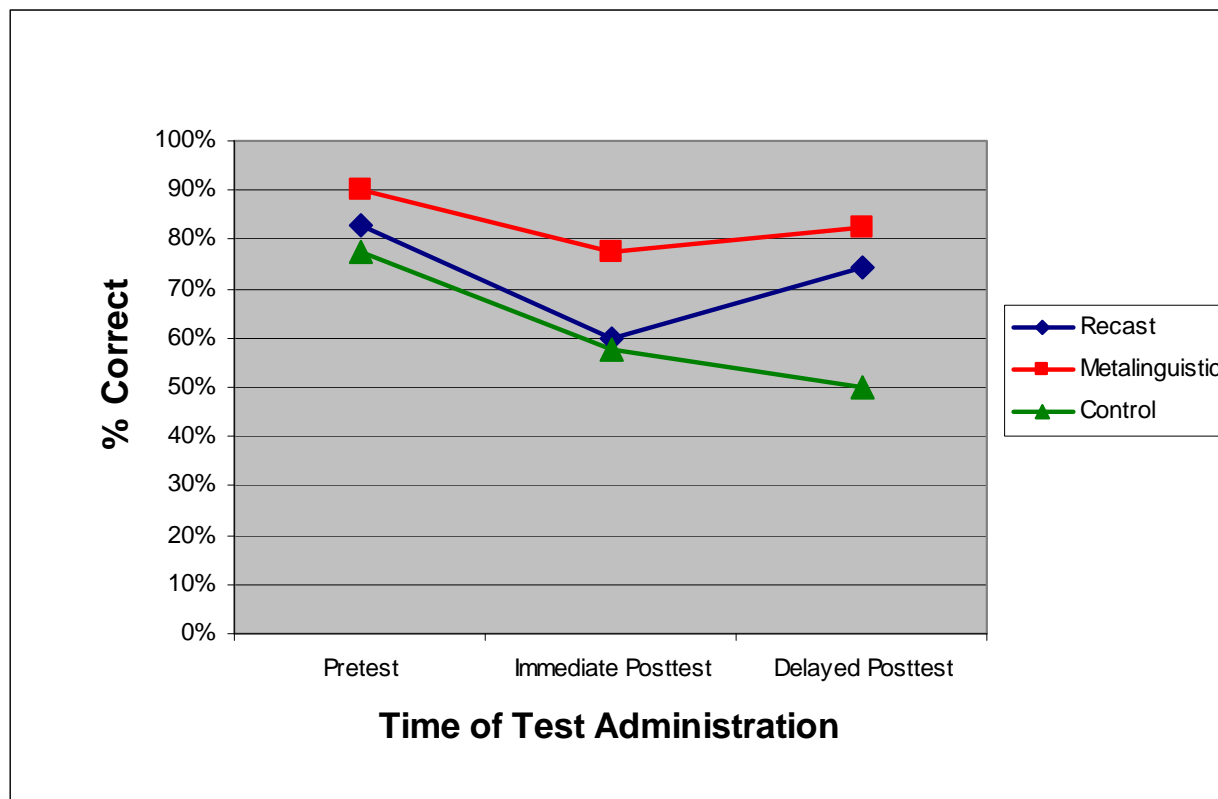


Figure 4. Group means for unrepeat items

Summary

Research Question 1 asked which type of computer-mediated corrective feedback would be significantly more effective for immediate gains in L2 target form knowledge. While metalinguistic feedback resulted in greater gains from pre- to immediate posttest for familiar items than did recasts, these differences were not significant. Thus, neither feedback type had a significantly greater effect on immediate target form knowledge.

Research Question 2 asked which type of computer-mediated corrective feedback would be significantly more effective for sustained gains in L2 target form knowledge. Results showed that, over time, the recast and metalinguistic group demonstrated similar levels of target form knowledge when applied to familiar items. Thus, neither feedback type had a significantly greater effect on target form knowledge over time.

DISCUSSION

From pre- to immediate posttest, the improvement in mean scores on repeated items for both feedback groups compared to the lack of improvement of the control group suggests that at least in a chat environment, recasts and metalinguistic feedback were helpful, albeit only statistically significantly so in the case of the metalinguistic feedback, for these intermediate and advanced learners. Though both kinds

of corrective feedback resulted in gains in immediate knowledge of the target form with repeated items, metalinguistic feedback may have had a greater effect than did recasts for several reasons. First, the ambiguity of the corrective intent of recasts in several cases may have persisted despite the use of text-chat. As Ellis et al. (2006) point out, full recasts, that is, recasts which consist of reformulations of the entire utterance containing the initial error, may not be as helpful in pointing learners to the location of the error as are partial recasts, which consist only of reformulations of the error minus the rest of the initial utterance.

In other words, the more information the learner is confronted with, the more difficult it may be for the learner to locate and identify the portion that is reformulated. This may have been the case in this study, in which, as a result of the high level of proficiency of the learners, some of the recasts were potentially too long to be immediately effective⁵. This can be seen in Excerpt A in which the reformulation of the target form comes at the very end of a 26-word sentence.⁶

Excerpt A⁷

Rikke6 Malmo: getting to know about the problem at a young age also makes us respect and in that way reduce for example industrial waste and stop the pollution Feb 28, 2007 10:56:57

AM EST

Natalie Penn: Okay, good. Feb 28, 2007 10:57:03 AM EST

Natalie Penn: getting to know about the problem at a young age also makes us respect and in that way reduce for example industrial waste and stop pollution Feb 28, 2007 10:57:21 AM

EST

In addition to length, two other characteristics of the recasts may have also mitigated their saliency: the location of the reformulation within the turn being recast and the lack of adjacency to the initial error. In Excerpt B, Roland7, following the recast, notices and reformulates another error, which was not reformulated but was in the initial position in the sentence. However, Roland7 neither acknowledges nor reuses the reformulation of *industry* at the end of the recast. Thus, the position of the reformulated target form within the full recast may have further influenced the degree to which it was noticed and identified by the learner. Despite the protracted processing time the written SCMC environment afforded participants, reformulations that occurred at the very end of a long sentence may still have been less likely to be noticed.

Excerpt B

Roland7 Malmo: perhaps that win energy will become a more efficient enegy souce for the industry.. Feb 28, 2007 10:14:35 AM EST

Roland7 Malmo: damm my spell is so off Feb 28, 2007 10:14:48 AM EST

Shadow Penn: win energy will become a more efficient enegy souce for industry. Feb 28, 2007 10:14:54 AM EST

Roland7 Malmo: Wind Feb 28, 2007 10:15:01 AM EST

The third factor influencing the effectiveness of the recasts in this study is the lack of adjacency of the recast to the initial utterance, a characteristic more commonly found in CMC as opposed to face-to-face recasts (Loewen & Erlam, 2006). As both Excerpts A and B show, it was not uncommon for additional turns to separate the recast from the initial utterance. In fact, the longer the initial sentence containing the error, the more likely it was for the recast to occur multiple turns later due to the length of time it took for the American informant to copy, modify and transmit the revised sentence. Thus, this lack of adjacency, coupled with the length of the recast, may have limited opportunities for the learner to recognize the recasts as corrective feedback and make comparisons between their own output in the initial utterance and the more target-like reformulation.

In contrast, metalinguistic feedback, in part due to its overtly corrective nature tended not to go unnoticed by the participants. This is particularly evident in the amount of uptake, a learner's utterance immediately following corrective feedback, "that constitutes a reaction in some way to the [interlocutor's] intention to draw attention to some aspect of the [learner's] initial utterance" (Lyster & Ranta, 1997, p. 49). Whereas 21% of the recasts elicited some form of uptake, 44% of the metalinguistic feedback elicited uptake, a third of which entailed application of the feedback, what Smith (2005) labels an apply response. This can be seen in Excerpt C. In this exchange, Monika9 responds initially to Christie's feedback with a question. Despite Christie's follow-up response⁸, Monika9's next turn indicates that she had unsuccessfully asked the teacher (the onsite researcher) for an explanation. Over the next few minutes, Christie and Monika9 resume the task before Monika9 supplies a turn articulating her understanding of the concept of the corrective feedback she had received and successfully applies it to the repair of an error with the target form in the initial turn.

Excerpt C

Monika9 Malmo: I'm thinking about what I know about the Swedish culture. It's in many ways not very different from the American culture I think. Feb 26, 2007 10:21:56 AM EST

Christie Penn: Monika9, be sure to use the zero article. Feb 26, 2007 10:22:18 AM EST

Monika9 Malmo: What is the zero article? Feb 26, 2007 10:22:31 AM EST

Christie Penn: It means no article. Feb 26, 2007 10:22:43 AM EST

Monika9 Malmo: Hmm, I asked my teacher what it means, but she said I had to ask you again. Can you explain what it means to me? Feb 26, 2007 10:23:27 AM EST

Christie Penn: That's okay. Don't worry about it for now. Can you write the next sentence? Feb 26, 2007 10:23:55 AM EST

Monika9 Malmo: Okay, I'll continue. Feb 26, 2007 10:24:11 AM EST

Monika9 Malmo: I think some Swedish literature is known in other countries. Feb 26, 2007 10:24:43 AM EST

Monika9 Malmo: Do you know anything about Swedish literature? Feb 26, 2007 10:24:56 AM EST

Christie Penn: Good. I don't know much I'm afraid. What can you tell me about it? Feb 26, 2007 10:25:24 AM EST

Monika9 Malmo: Ah, I think I know what you mean with zero article now. You meant I shouldn't write "The American culture", it should be only "American culture", right? Feb 26, 2007 10:25:47 AM EST

What is also revealed in this excerpt is that Monika9's application occurred nearly three and a half minutes after the feedback was provided, suggesting that the slower and more deliberate nature of the written SCMC interaction enabled the feedback to remain in play for an extended period of time. Thus, the deliberate and slower nature of the chat interaction may have afforded Monika9 sufficient time to both process the metalinguistic hint encoded in the feedback and to produce a modified response. It is also possible that the enduring nature of the written turns also facilitated the application of the corrective feedback to the initial noun phrase even after 9 intervening turns. Thus, these features of the text-chat medium together with higher rates of uptake following metalinguistic feedback compared to recasts may have given the participants in the metalinguistic group the time and opportunity to notice, analyze and internalize the corrective feedback.

The beneficial effects stemming from greater processing time that was afforded learners to produce modified output may have therefore had a positive effect on orienting their attention to the target form and on stimulating their actual production of the target form, thereby enhancing learners' knowledge and control over the zero article (at least with repeated abstract noncount nouns). Analysis of pretest and posttest acceptability judgment scores for all items revealed that all three participants who produced modified output in the form of repair of the target form (Markus4, Martina5, Monika9) improved from pre- to posttest with two achieving perfect scores on the immediate posttest (100% accuracy for both

repeated and unrepeatd items) and the third scoring 13 out of 15 (90% accuracy for repeated items and 80% accuracy for unrepeatd items). These results corroborate findings from other studies that found a positive relationship between output and language development (Izumi, 2002; Lyster, 2004; Paninos, 2005).

Limitations

In addition to the small sample size and its short duration, several limitations were present in this study. The first concerns the design and the sensitivity of the acceptability judgment test. As mentioned previously, the Blackboard interface limited the format of the acceptability judgment items, so that participants were presented with multiple variations of each sentence and asked to select the most acceptable. By simultaneously providing participants both acceptable and unacceptable versions of the same sentence, the instrument may have simplified the decision-making process required of acceptability judgment tests and potentially triggered recognition of the most acceptable sentence. Without being presented with these three options, it is possible, that participants may have achieved slightly lower and more varied scores.

The second limitation concerns the nature of the target form itself. Results for unrepeatd items for all groups indicated a drop from pretest to posttests, suggesting that neither type of corrective feedback enabled learners to generalize application of the zero article to new abstract non-count nouns. This finding may not be surprising considering the fact that most unrepeatd nouns on the immediate and delayed posttests (e.g., adolescence, adulthood, vision) were not semantically or orthographically related to the nouns used in the writing activities to elicit opportunities for corrective feedback.

Findings may also indicate that corrective feedback on the application of the zero article to abstract noncount nouns does not easily lend itself to generalization for most learners. The improvement of both feedback groups relative to the control group with only familiar items may also be evidence that what most participants experienced was item-based and not rule-based learning (Skehan, 1998). That is to say, during this short term study, the limited amount of corrective feedback participants received may have allowed for the noticing and recall of the zero article with specific lexical items (a memorized sequence). However, it may not have been sufficient to facilitate elaboration and comparison of new input with previous language input and hypotheses to derive a rule (Williams, 1999) connecting the zero article with abstract noncount nouns in English. Furthermore, as has been observed in studies examining the acquisition of artificial languages, the use of acceptability judgment items may have served to tap in to item-based learning by merely requiring participants to recall and compare a memorized sequence with each test item as opposed to evaluating each item in light of an abstract rule system (Ellis, 1996).

In addition, the complexity of the English article system and its partial overlap with the Swedish article system may indicate that, in the absence of additional target-form instruction or consciousness-raising activities regarding differences and overlap in the two article systems, short-term intervention in the form of corrective feedback may have at best a limited ephemeral effect on learning. Feedback studies on similarly complex or difficult to learn forms may therefore best be carried out in conjunction with instruction.

Also of note is the very limited amount of corrective feedback participants received, approximately 2-3 total feedback episodes on average. This may have been an artifact of the relatively open nature of the task which meant participants could use certain items in the word bank in a non general sense, eliminating potential errors with the target form and reducing opportunities for feedback (e.g., **Monika9 Malmo**: And the world effects space, because of all the pollution.) Providing the native English-speaking interlocutors with partial sentences intended to elicit general meaning from the Swedish participants might help increase the amount of feedback to levels that might more likely facilitate the noticing and learning of a particularly low salient and difficult to generalize form.

CONCLUSION

This study has examined the relative effectiveness of two different types of computer-mediated corrective feedback on the immediate and sustained development of L2 target form knowledge. Despite the fairly limited amount of feedback generated, the results indicated that both types of corrective feedback supported gains in target form knowledge in familiar contexts but that neither type was significantly more effective than the other in either the immediate term or over time. That the metalinguistic group showed significant immediate gains relative to the control condition also provides evidence regarding the effectiveness of computer-mediated corrective feedback that alerts learners to the nature of their errors for developing short-term knowledge of L2 grammar. Results suggest potential directions for further studies of computer-mediated corrective feedback to add to the growing body of feedback research that can help us understand what kinds of feedback work best for which learners and which forms, whether this feedback be oral or written, face-to-face or computer-mediated.

APPENDIXES

Appendix A: Participant Profiles

	ID	Group	L1(s)	Dialang	Gender	Age	Number of Years English Studied
1	Co1	Control	Swedish	C2	F	22	12.5
2	Co2		Swedish	C2	F	25	9.5
3	Co3		Swedish	C1	F	47	9.5
4	Co4		Swedish	B1	F	28	8
5	Co5		Swedish	B2	F	21	9.5
6	Co6		Spanish	-	F	22	8
7	Co9		Swedish	-	M	21	10
8	Co10		Swedish/Spanish	-	F	20	12
9	Re2	Recast	Swedish	C2	F	29	15
10	Re6		Swedish	-	F	24	9
11	Re7		Swedish	-	M	20	9
12	Re8		Bosnian	-	M	20	10
13	Re9		Swedish	C1	F	23	10
14	Re12		Swedish/Filipino	-	F	19	13
15	Re13		Bosnian	-	F	21	8
16	Me1	Metalinguistic	Swedish	-	F	22	10.5
17	Me2		Swedish	C2	F	23	10
18	Me3		Bosnian/Swedish/German/Italian	-	F	20	9
19	Me4		Swedish	-	M	25	10
20	Me5		Swedish	C1	F	21	10
21	Me6		Arabic	B1	F	34	27
22	Me9		Swedish	-	F	20	10
23	Me11		Swedish	-	F	24	11

Appendix B

Activity 1: Instructions for Swedish Participants

Intro to Sweden for Americans

You will be writing sentences about the mentality, the values, and the culture of Sweden for an American audience. (Think of it as writing an essay sentence by sentence.) Your partner will be helping you. You each have a different word bank of 10 words (10 verb phrases or 10 noun phrases) which you must use in your sentences. First share your words with your partner; then begin writing.

You will have **20 minutes** to complete this activity:

Word Bank

unemployment	Swedish architecture
Swedish culture	alcohol
Swedish history	immigration to Sweden
Swedish literature	education in Sweden
nationalism in Sweden	Swedish society

Appendix C

Activity 1: Instructions for American Participants

Intro to Sweden for Americans

You will be writing sentences about the mentality, the values, and the culture of Sweden for an American audience. (Think of it as writing an essay sentence by sentence.) Your partner will be helping you. You each have a different word bank of 10 words (10 verb phrases or 10 noun phrases) which you must use in your sentences. First share your words with your partner; then begin writing.

You will have **20 minutes** to complete this activity:

Word Bank

travel	visit
experience	appreciate
understand	believe
drink	become
increase	decrease

Appendix D

Activity 2: Instructions for Swedish Participants

Environmental Issues

You will be writing sentences about the environment. (Think of it as writing an essay sentence by sentence.) Your partner will be helping you. You each have a different word bank of 10 words (10 verb phrases or 10 noun phrases) which you must use in your sentences. First share your words with your partner; then begin writing.

You will have **20 minutes** to complete this activity:

Word Bank

nature	global warming
space	nuclear power
mankind	industrial waste
carbon dioxide	pollution
wind energy	industry

Appendix E

Activity 2: Instructions for American Participants

Environmental Issues

You will be writing sentences about the environment. (Think of it as writing an essay sentence by sentence.) Your partner will be helping you. You each have a different word bank of 10 words (10 verb phrases or 10 noun phrases) which you must use in your sentences. First share your words with your partner; then begin writing.

You will have **20 minutes** to complete this activity:

Word Bank

threaten	allow
cause	reduce
increase	respect
preserve	produce
require	become

Appendix F: Repair and Responses to Recasts

Noun Types Recast	Nouns Recast	Recasts Eliciting Responses but not Repair	Recasts Eliciting Repair
Exclusively Uncountable Nouns (n=7)	architecture (1) unemployment (2) immigration (1) global warming (2) pollution (1)	immigration (1)	
Nouns with Countable and Uncountable Uses (n=12)	society (2) power nature(2) industry (2) energy (1) education (4)	society (1) nature (1) education (1)	
	19	4	0

NOTES

1. This is not to say that the perceptual salience of difficult to notice L2 forms cannot be manipulated in oral feedback. Indeed, research on oral treatments that utilizes enhancement techniques (Doughty & Varela, 1998; Loewen & Philp, 2006; Nassaji, 2007) has found evidence supporting the positive effect of enhancement techniques on promoting form noticing. However, without the aid of enhancement techniques, certain morphemes that may be unstressed or elided in non-enhanced speech (e.g., *Er hat den Ball* 'He has the ball'.) may prove more challenging for L2 learners to notice or accurately distinguish than in written interaction, in which orally unstressed and elided morphemes receive distinct orthographic representations.
2. Responses on a post-treatment survey regarding prior target form knowledge and instruction indicated that only one participant, a member of the control group, recalled ever receiving prior direct instruction on the English zero article several years earlier. However, almost all participants indicated a partial degree of familiarity and partial confidence in their use of the English zero article with noncount nouns to express general meaning prior to the study.
3. Chatscripts of all interactions were stored electronically and searched for occurrences of targeted abstract noncount nouns and accompanying feedback episodes, which were highlighted. To identify feedback episodes, chatscripts were reviewed for reformulations of prior turns and searched electronically for occurrences of scripted meta-statements that referenced the zero article. Printouts of each chatscript were further analyzed for production of non-targeted abstract noncount nouns.
4. Diagnostic tests were run on the data to verify that the assumptions of normality and homogeneity of variance were met. The Shapiro-Wilk test was used to determine whether the distribution of each sample differed significantly from a normal distribution. Results showed that only one sample differed significantly from a normal distribution. The results of the Shapiro-Wilk test for the metalinguistic group's delayed posttest indicated that this sample's distribution was significantly different from normal. However, the kurtosis and skewness of this population were also calculated and found to be small: -1.5

and 0.7 respectively. The Levene Test for homogeneity of variances also revealed no significant difference in the variances among the samples. See Sauro, 2007, for detailed results.

5. One anonymous reviewer pointed out, though not necessarily the case in this study, that it is worth considering that full recasts in a chat environment may still enable learners to identify the reformulation. Because the chat window makes lengthy repetition of a prior utterance unusual in chat, particularly when the prior turn is still visible, it is possible that learners could find full recasts more noticeable in a chat environment than in spoken interaction.

6. As one anonymous reviewer pointed out, another factor possibly limiting the learner's ability to attend to recasts concerns the perceived countable or uncountable nature of the focal noun. Though all nouns included in the word banks have uncountable uses, some are exclusively uncountable (e.g., unemployment), while others are primarily uncountable with countable uses (e.g. education) (Biber, Johansson, Leech, Conrad & Finegan, 1999). As a result, if participants perceived certain nouns as countable and therefore not likely candidates to take the zero article, they may have been less inclined to attend to recasts. However, comparison of participants' responses to recasts of nouns that are exclusively uncountable (n=7) and those that have both countable and uncountable uses (n=12) revealed that participants were as unlikely to respond to either, and neither type resulted in self-repair (see [Appendix F](#)).

7. Errors and feedback are highlighted here though no such highlighting occurred during the actual interaction.

8. Results from the preliminary study had indicated that not all participants were likely to be familiar with the term zero article though they were familiar with the concept. As a result, the native English-speaking interlocutors were instructed to define the zero article with "It means no article" when asked and to guide the conversation immediately back to the task.

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